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## 1. INTRODUCTION

NOAA's Pacific Marine Environment Laboratory developed and distributes the Live Access Server (LAS), a popular Web-based system for providing access to geo-referenced scientific data. At the Climate Diagnostics Center we are continuing to experiment with this system for providing Web-based access to our collection of climate data.

As climate data providers we must offer robust and flexible mechanisms for users to search for data, create plots and subsets of data and download data from our Web site. The Live Access Server user interface goes a long way toward meeting these goals. However, in order to provide interfaces that more closely match the character of the data being examined we have created custom interfaces for LAS.

Some data sets include many different time intervals, average periods and secondary statistics for the same physical parameter. An expanding hierarchical menu is an effective way to organize and present these complex choices to the user. An alternative user interface for LAS using hierarchical menus was discussed in Schweitzer (2001). However, some data sets that we distribute are extremely uniform, with exactly the same time intervals and statistics for many different physical parameters. An interface that exposes these similarities to the user is a good design choice for these data sets. Repeated information is not hidden behind expanding menus. Users can make choices without opening secondary menus. This paper provides details of integrating this type of interface with the current LAS software.

## 2. THE CURRENT LAS INTERFACE

An XML file is used to configure the current LAS user interface. Software provided with LAS serializes the information in the XML file into a relational database. When a data set is selected on the user interface, Perl templates are used to extract the data from the database and construct a submenu of the variables available for that data set.

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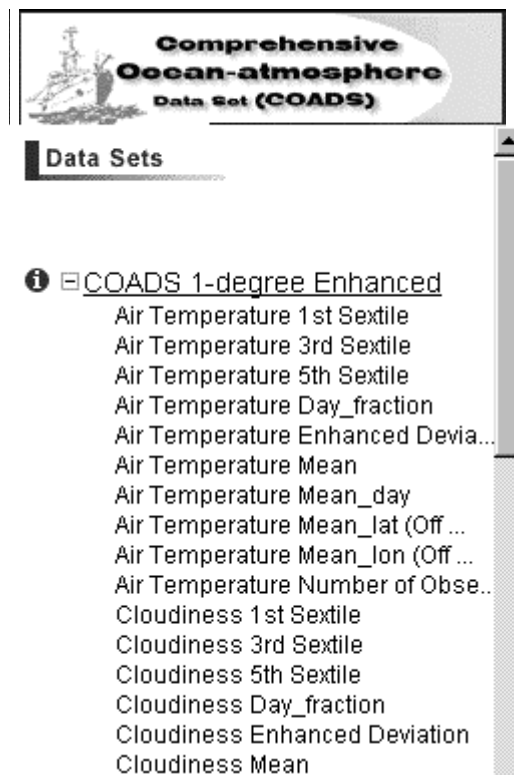


Figure 1. Data set and variable selection menu.

Figure 1 shows an example of the default presentation of the information needed to select a data set and variable. This example uses the Comprehensive Ocean-Atmosphere Data Set (COADS). In COADS each physical parameter has the same ten associated statistics. The default user interface requires that each of these combinations of physical parameter and statistic be presented as an entry in the menu. As a result, the menu contains a great deal of repeated information. While the user interface is easy to create using the software that is distributed with LAS, an alternative custom interface will be easier to use.

## 3. REJECTED ALTERNATIVES

Several alternatives were considered. As discussed in the introduction, a hierarchical menu was already being used as an alternative user interface.

However, as illustrated in Figure 2, the repetitive nature of the selections needed for COADS makes this alternative more cumbersome than the original. The list of associated statistics is repeated in the hierarchy for each physical parameter.

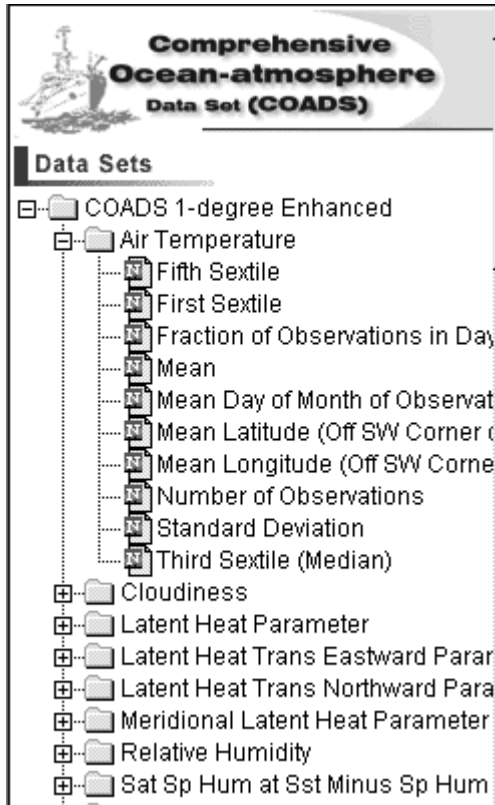


Figure 2. Hierarchical menu interface.

#### 4. THE CUSTOM USER INTERFACE

HTML forms have several options for presenting the user with choices to be selected. As seen in the previous two examples, a menu with either a single level or a hierarchy is a common user interface element. An alternative is to group choices together and use the "check box" or "radio button" user interface widget to allow users to make selections.

The current LAS machinery can only process one selection at a time, so the "radio button" interface, which only allows one selection per group, is the logical choice. There are, however, three choices that need to be presented to the user. They are: the data set, the statistic and the variable. This means that the final user interface will have three groups of radio buttons – one for each selection needed. Figure 3 shows a section of the radio button interface. The list of associated statistics needs to be shown only once rather than repeated for each physical parameter.

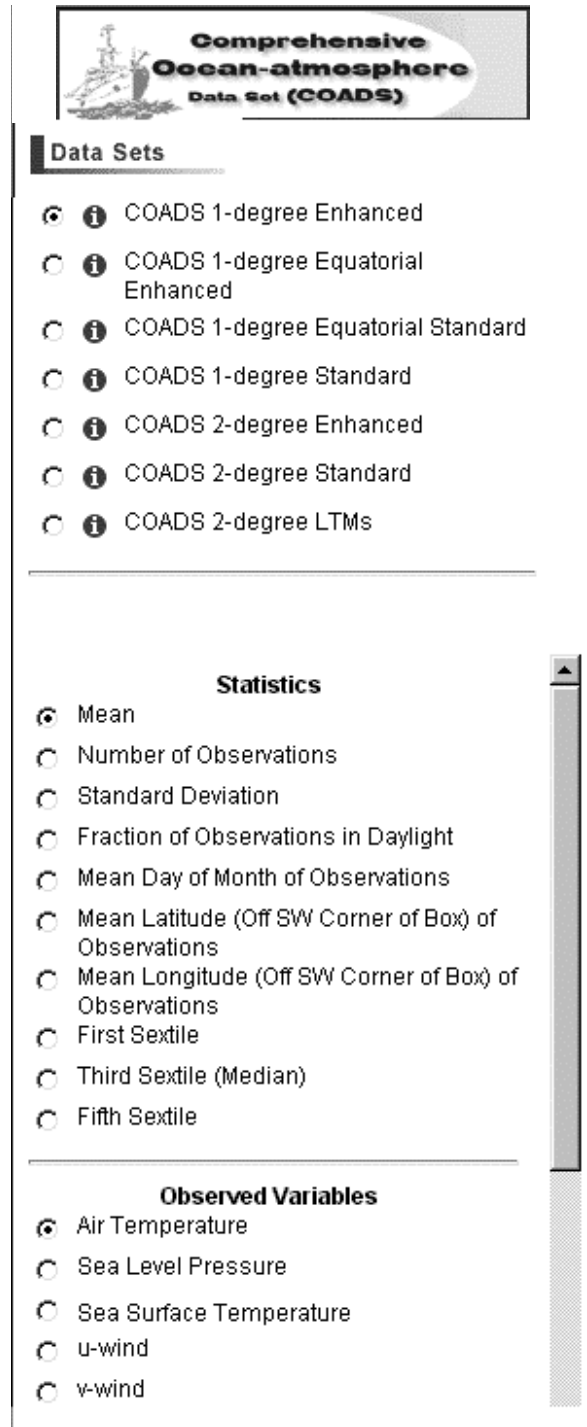


Figure 3. Radio-button interface.

The choice of HTML form widgets is a basic step in all user interface design. However, making the correct choice was critical to our design. Now that the user interface elements that make the best presentation have been selected the next step is to tie the chosen user interface elements into the existing user interface.

## 5. TYING IT ALL TOGETHER

Any customization must work with the other components of the user interface. The customizations should not deviate from the basic layout of the current interface so that users familiar with other LAS installations will know where to look for each of the major components.

JavaScript allows the user interface designer to build elements, which can respond immediately to user input without requesting a new page from the Web server. The current LAS user interface takes advantage of JavaScript to give the user feedback about the selections they have made. For example, when a user selects one of the variables listed in Figure 1, other user interface elements are updated to show the name of the data set and variable selected and the geographic and time extents for that variable.

The current interface uses a large JavaScript data structure to update those user interface elements that change when a variable is selected. The data structure that describes a particular data set is loaded when that data set is selected. In order to retain this behavior it is necessary to find a way to relate the three sets of radio buttons to the JavaScript data structure. Normally, LAS uses the information that is stored in the database on the server to maintain these linkages.

Because of the extremely regular structure of the data sets being presented in the custom interface, it was possible to write a JavaScript function, which calculates the index of the data object needed to update the user interface when a selection is made. This function made it possible to update the other pieces of the user interface without making a call back to the server to query the database to find the index of the data object needed.

## 6. FUTURE PLANS

One of the advantages of the simplified user interface is that many different options are presented to the user at once. Currently a user can only select one combination, but can easily see many other combinations that they might like to select. In the future we would like to be able to expand the capabilities of the server so that it could respond in a logical and consistent manner if multiple selections were allowed. For example, when plotting the user could be presented with side-by-side plots of the parameters selected. When a subset is requested, a file containing all the parameters selected could be made available for download.

## 7. CONCLUSIONS

When we began this project we were convinced that the hierarchical menus system we had designed previously would be ideal for this project too. During user testing of early prototypes it became clear that, while the

technology used to create the hierarchical interface was impressive, the usability was actually worse than the default interface.

By returning to first principles of user interface design and adopting the simplest user interface possible we were able to improve the usability of the system.

## 8. ACKNOWLEDGEMENTS

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